

Industrial robots and manufacturing machines

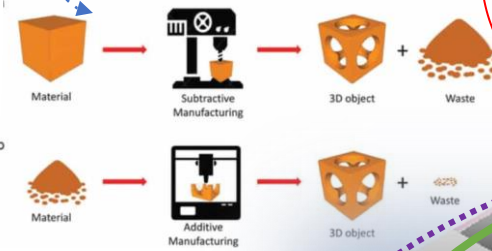
General properties of manufacturing machines:

- Main movement is made by the tool/workpiece
- Side movement is made by the workpiece/tool
- Its kinematics are linear or parallel
- Number of controlled axels (Degree of Freedom)
- Relationship of the controlled axels
- Structural design

Main movement and side movement differ between types of cutting machine tools. For example, in the case of a lathe, the workpiece performs the main movement (rotates) and the tool performs the secondary movement, however, in the case of milling machines, the main movement is performed by the tool

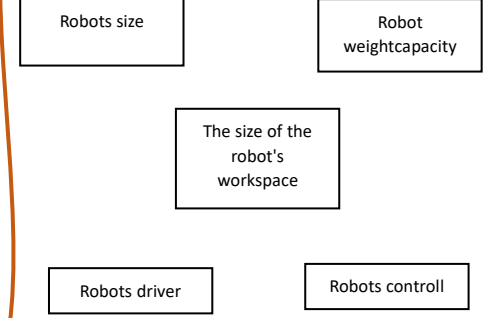
Is machining additive or subtractive?

- If material is added to the workpiece -> Additive
- If material is cut off from the workpiece (sliced) -> Subtractive



The **production process** is the set of activities, as a result of which materials and semi-finished products (prefabricated products) become finished products corresponding to their purpose.

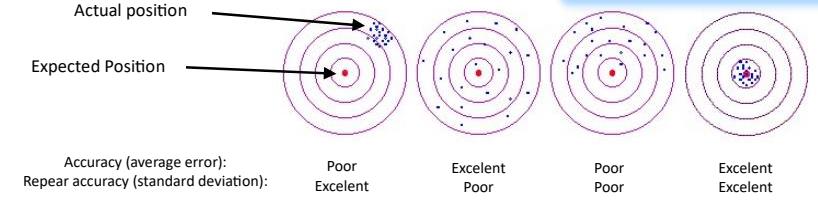
General features of robots:



The most important features of the robot in terms of production are its accuracy and repeatability

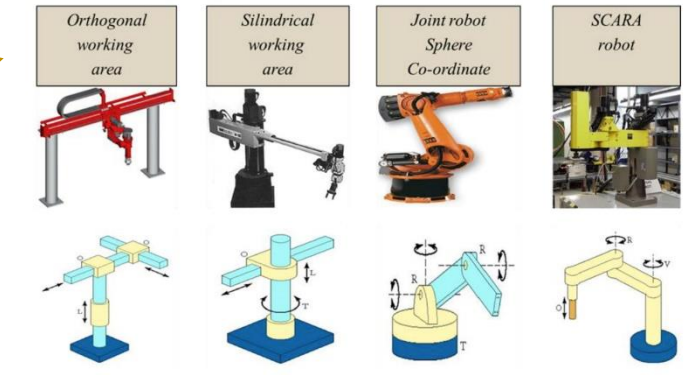
Positioning accuracy: If the reference coordinate system is repeatedly set to the same programmed position in a given configuration of the robot, the standard deviation between the actual positions of the reference coordinate system in the world coordinate system. Its measure, like the positioning accuracy, is a six-element vector or the standard deviation

Positioning accuracy: In the case of a given configuration of the robot, the difference between the programmed position in the world coordinate system and the position actually occupied by the coordinate system fixed to the reference point on the robot's executive member. Positioning accuracy is a statistical quantity that can be specified by a six-element vector (3-directional location and 3-directional angular error - average). This is a quantity dependent on the robot configuration and location within the workspace,



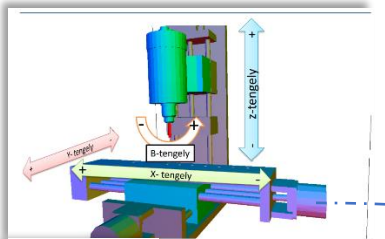
Accuracy (average error):
 Repair accuracy (standard deviation):
 Poor Excellent Excellent Poor Poor Poor Excellent Excellent

Robot programming can be done online or offline. A robot program can be simulated with the robot manufacturer's simulation software or with



Collaborative robots

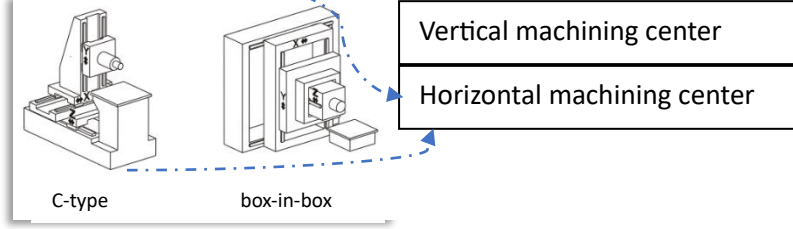
The person works together with the robot, interacts with it, helps its cognitive and sensory abilities, and the two of them solve the tasks together, but in this case without a safety grid, fence or Plexiglas demarcation.



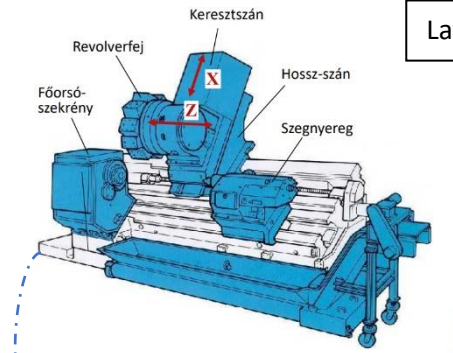
Milling machines

As an important rule, it should be noted that the control works on the basis of axes created according to the Cartesian coordinate system. Of these, the Z axis is always the axis parallel to the main spindle. After that, the X and Y axes of the space are defined. (X-axis is usually always the horizontal axis. If there are 2 horizontal axes, the X axis will be the longer axis)

The secondary axes denote the axes of rotation around the main axes with the names A, B, C. They are paired with: A-X, B-Y, C-Z axes.

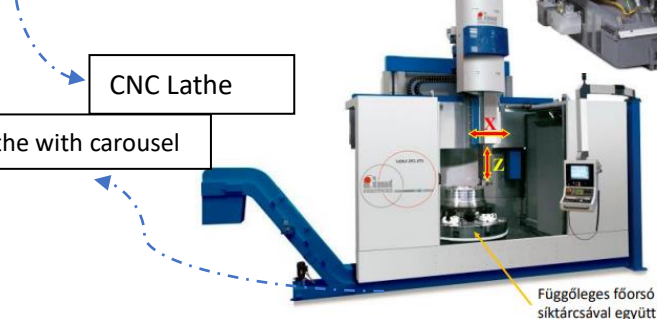


Vertical machining center Horizontal machining center



Lathes

Twin-spindle turning center



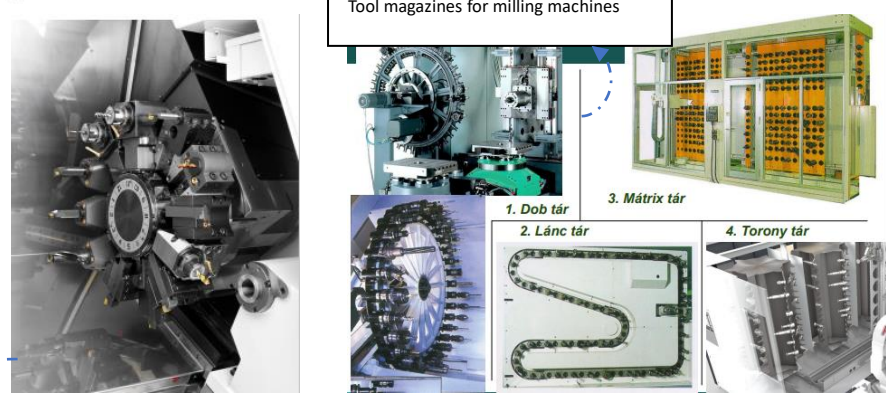
CNC Lathe

CNC lathe with carousel!

Lathe revolver head

Függőleges főorsó (gyakori a síktárcsával együtt történő mdb cseré)

Tool changers and magazines



Tool magazines for milling machines

Production cell

